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Search Results -

Terms	Documents
L11 and (select$ same (first$ with rang$)) and (select$ same (second$ with rang$))	6

Database:
US Pre-Grant Publication Full-Text Database
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Search: L13

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Search History

DATE: Friday, July 14, 2006 Printable Copy Create Case

Set Name side by side	Query	Hit Count	Set Name result set
	DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; THES=ASSIGNEE; PLUR=YES; OP=OR		
	L11 and (select$ same (first$ with rang$)) and (select$		

L13	same (second$ with rang$))	6	L13
L12	L11 and (first$ with rang$) and (second$ with rang$)	9	L12
L11	L10 and (select$ with (rang$ or freq$))	12	L11
L10	L9 and (operat$ with (freq$ or range or capab$))	12	L10
L9	l7 or l8	22	L9
	DB=PGPB,USPT; THES=ASSIGNEE; PLUR=YES; OP=OR		
L8	(6589131 | 6508139 | 5179868 | 20040010361 | 20020115527 | 20040011609 | 6835162 | 6866611 | 20040186646 | 5078242 | 6698555 | 6701797 | 5409434 | 20040162661 | 5505674 | 6139468)![PN]	16	L8
	DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; THES=ASSIGNEE; PLUR=YES; OP=OR		
L7	('6996465'| '6983668'| '20040249541'| 'US20040248687A'| '20040162661') [ABPN1,NRPN,PN,TBAN,WKU]	7	L7
L6	('6996465'| '6983668'| '20040249541'| 'US20040248687A'| '20040162661')[URPN]	0	L6
L5	L4 or 6983668.pn.	5	L5
L4	L2 and 701/51.ccls.	3	L4
L3	L2 and 701.51.ccls.	0	L3
L2	L1 AND "AUTOMATIC TRANSMISSION" AND (vehicle or automobile or car)	141	L2
L1	"SHIFT-BY-WIRE" OR "SHIFT BY WIRE"	277	L1

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Search Results - Record(s) 1 through 3 of 3 returned.

☐ 1. Document ID: US 20040249541 A1

L4: Entry 1 of 3 File: PGPB Dec 9, 2004

PGPUB-DOCUMENT-NUMBER: 20040249541
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☐ 2. Document ID: US 20040162661 A1

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INVENTOR-INFORMATION:

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☐ 3. Document ID: US 6996465 B2

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DOCUMENT-IDENTIFIER: US 6996465 B2

TITLE: Shifting system for vehicle

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DOCUMENT-IDENTIFIER: US 20040186646 A1
TITLE: Range determination apparatus, range determination method, and program therefor

Pre-Grant Publication (PGPub) Document Number:
20040186646

Summary of Invention Paragraph:
[0006] In a conventional vehicle in which a gear ratio is changed by a transmission, for example, an automatic transmission such as a staged automatic transmission, a continuously variable transmission (CVT) or the like, responsive to range selection by operation of a shift lever, an automatic transmission control unit (ECU) switches a solenoid or the like on or off in accordance with a gearshift logic for the selected range and thereby controls gearshift of the transmission. For this purpose, the automatic transmission is provided with a range determination apparatus that receives an output signal from a sensor, determines a range on the basis of the output signal, and determines the selected range.

Summary of Invention Paragraph:
[0007] The sensor mentioned above may be a contact-type sensor having a movable-side terminal and a plurality of fixed-side terminals. The movable-side terminal is attached to a manual shaft that is turned by operation of the shift lever. The fixed-side terminals, with which the movable side terminal is in contact, are attached to a sensor case and provide sliding contact upon turning of the manual shaft. With this contact-type sensor, when the shift lever is operated to select a range, the movable-side terminal is turned via the manual'shaft in accordance with the turning angle of the shift lever, whereby the pattern of contact between the movable-side terminal and the fixed-side terminals is changed. This causes a change in resistance in the electric circuit including the movable-side terminal and the fixed-side terminals. In accordance with this change in the contact pattern, the sensor generates an output signal corresponding to the turning angle of the manual shift, which output signal is either a voltage value or a current value.

Summary of Invention Paragraph:
[0008] Upon receiving the output signal from the contact-type sensor, the range determination apparatus compares the value of that output signal with thresholds as criteria for respective ranges, determines a range, and then determines the selected range. The thresholds (limits) are set in advance as voltage values or current values, depending on the type of the output signal (see U.S. Pat. No. 4,914,594).

Summary of Invention Paragraph:
[0009] However, in the aforementioned contact-type sensor and in the non-contact-type sensor of the related art, when the output value of the sensor is determined, the position of the shift lever is univocally determined, so that the selected range is unequivocally determined. In other words, only a single combination of thresholds for determining a range is set for a given output value of the sensor and a determination of range is made according to a single shift range determination pattern. Therefore, even if different control operations are

performed in an automatic transmission control unit, only one item of range information can be obtained. In other words, optimal range information cannot be obtained for each of the various control operations.

Summary of Invention Paragraph:
[0011] According to one aspect of the present invention, a range determination apparatus comprises a sensor that generates a continuous output signal in response to operation of a shift operation member for selecting a range in a power train, and range determination processing means that compares the value of the output signal with a range determination pattern arbitrarily set for a control operation and that determines a range for that control operation.

Brief Description of Drawings Paragraph:
[0022] FIG. 1 is a schematic view showing a first embodiment of a range determination apparatus in accordance with the present invention.

Brief Description of Drawings Paragraph:
[0023] FIG. 2 shows ranges for control operations correlated with voltage values of the signal of a sensor in the first embodiment of the present invention.

Brief Description of Drawings Paragraph:
[0025] FIG. 4 illustrates range patterns utilized in the first embodiment of the present invention.

Brief Description of Drawings Paragraph:
[0026] FIG. 5 is a flowchart of a limit (threshold) setting routine for forming the range patterns of FIG. 4, in accordance with the first embodiment of the present invention.

Brief Description of Drawings Paragraph:
[0027] FIG. 6 illustrates range patterns utilized in a second embodiment of the present invention.

Detail Description Paragraph:
[0033] FIG. 1 shows the first preferred embodiment as including a range determination apparatus 11, an automatic transmission case 12, and a manual shaft 13. The range determination apparatus 11 includes a control unit case 16, here a box-like body disposed outside the automatic transmission case 12, a sensor 14 attached to the manual shaft 13 in the control unit case 16, an automatic transmission control unit 15, a connector 17 mounted outside the control unit case 16 and the like. The automatic transmission control unit 15 disposed inside the control unit case 16 functions as a computer and controls the automatic transmission. The connector 17 has a plurality of terminals connected to a plurality of various components. Such components include, for example, solenoids in the automatic transmission, such as linear solenoids, on-off solenoids, and the like, the engine, indicators, vehicular control elements, and the like. The sensor 14 and the automatic transmission control unit 15 are electrically connected to each other and constitute a control unit integrated with a sensor.

Detail Description Paragraph:
[0035] The manual shaft 13 extends through the automatic transmission case 12, and connects outside the case 12 to an outer lever 18 and is coupled, via the outer lever 18 and a control wire 19, to a shift lever 21 which serves as a gearshift operation member. Inside the automatic transmission case 12, the manual shaft 13 is coupled to a detent 31 and a valve spool 33 of a manual valve 32. The detent is a plate presenting an edge with plural detents or notches corresponding to the various ranges for selectively receiving an operating member 8 of the manual value 32. The shift lever 21 is manually movable for selection of a range for the automatic transmission. Hence, the manual shaft 13 and detent 31 are turned as the shift lever 21 is moved along a guide 22 between positions for the different ranges

such as a parking range (P range), a reverse range (R range), a neutral range (N range), a drive range (D range), a fourth-speed range, a third-speed range, and a second-speed range. The fourth-speed, third-speed, and second-speed ranges can be established by an automatic gearshift operation, or by a manual gearshift operation.

Detail Description Paragraph:
[0036] The sensor 14 is coupled to the manual shaft 13, and has a rotating wheel 24 that turns integrally with the manual shaft 13. The sensor 14 detects the turning angle of the rotating wheel 24 indicating the movement of the shift lever 21, namely, turning angle e expressed in units of "degrees." The sensor 14 is itself conventional and is a non-contact type which generates and outputs one continuous analog signal that changes in accordance with extent of movement of the shift lever 21, namely, a range detection signal output (sensor output) as a voltage value ("voltage") in the first embodiment.

Detail Description Paragraph:
[0039] In an automatic transmission equipped with the range determination apparatus 11 of the first embodiment, ranges such as the parking range, the reverse range, the neutral range, the drive range, the fourth-speed range, the third-speed range, and the second-speed range are set as described above, by operation of the shift lever 21. A voltage value and the angle e of the sensor 14 are so set as to correspond to each of the ranges. Each voltage value serves to determine a range set by the shift lever 21, and the limits (thresholds) serving as criterial valués (criteria) are voltage values for determining a range independently for each of the control operations.

Detail Description Paragraph:
[0040] As the shift lever 21 is moved along the guide 22, the manual shaft 13 is turned via the control wire 19 and the outer lever 18 and the detent 31 are turned integrally with the turning of the manual shaft 13. The valve spool 33 coupled to the detent 31 through operator rod 8 is moved in accordance with turning displacement of the manual shaft. 13, and generates range pressures such as a second-range pressure, a third-range pressure, a fourth-range pressure, a D-range pressure, an R-range pressure, and the like.

Detail Description Paragraph:
[0041] As the shift lever 21 is selectively moved to one of range positions P, R, N, D, 4, 3 and 2 indicated on the guide 22 and representing the respective ranges, the valve spool 33 moves to a valve position preset in association with said one of the range positions to set the manual valve 32 at a corresponding hydraulic pressure generation position and the automatic transmission is shifted to a range corresponding to the hydraulic pressure generation position. With the automatic transmission set to a range, the detent 31 prevents the manual shaft 13 from turning, and the shift lever 21 is held at the selected range.

Detail Description Paragraph:
[0054] In the range determination apparatus 11 of the first embodiment, as shown in FIG. 3, the automatic transmission control unit 15 includes a range determination processing means 42, and a range determination logic for determining a range is stored in memory 44. The range determination logic is designed for execution of a range determination routine and for determination of ranges for the control operations such as automatic transmission control, engine control, indicator control and the like, on the basis of the aforementioned limits. More specifically, the range determination logic is designed, for example, to determine a range for linear solenoid control, to determine a range for on-off solenoid control, to determine a range for start lock control, to determine a range for shift lock control, to determine a range for key lock control, to determine a range for failure detection control, to determine a range for reverse control, to determine a range for indicator control, and to determine a range for engine idle control. In

this case, since only one range signal is generated by the rotating wheel 24, the sensor 14 can be simplified in structure.

Detail Description Paragraph:
[0055] In the range determination apparatus 11 of the first embodiment, the limits (thresholds) used in determining a range are set arbitrarily or individually and independently for each of the control operations such as engine control, indicator control and the like. That is, a range determination pattern composed of limits or "thresholds" for each of the ranges is set for each of the control operations. Thus, the voltage value is compared with the range determination pattern for each of the control operations, and a range can be determined by comparing the voltage value with a range defined by the limits.

Detail Description Paragraph:
[0057] Referring to FIG. 2, limits Vi (i=1, 2, . . . , 30) increase as the value "i" increases, and decrease as the value "i" decreases. The limits Vi for each of the control operations are shown in FIG. 2 only as examples and can be arbitrarily set. In the first embodiment, for convenience of explanation, a range between two limits Vi such as limits Vm and Vm+1, namely, a voltage value range is defined by the limits ("thresholds") Vm-Vm+1, i.e., equal to or larger than Vm and smaller than or equal to Vm+1.

Detail Description Paragraph:
[0058] In the range determination apparatus 11 of the first embodiment, the parking range, the reverse range, the neutral range, the drive range, the fourth-speed range, the third-speed range, and the second-speed range are first set as ranges for linear solenoid control, as in the case of the gearshift ranges in the automatic transmission of the related art. The ranges for linear solenoid control are determined as follows.

Detail Description Paragraph:
[0065] A voltage value range of V29-V30 is set as the second-speed range for linear solenoid control. If a voltage value output from the sensor 14 during linear solenoid control is within the voltage value range of V29-V30, the range determination processing means determines the second-speed range for linear solenoid control, and sets the automatic transmission in the second-speed range for linear solenoid control.

Detail Description Paragraph:
[0067] The range determination apparatus 11 of the first embodiment sets the parking range, the reverse range, the neutral range, the drive range, the fourth-speed range, the third-speed range and the second-speed range for on-off solenoid control, as in the case of the aforementioned ranges for linear solenoid control. The ranges for on-off solenoid control are determined as follows.

Detail Description Paragraph:
[0070] A voltage value range of V15-V22 is set as the neutral range in on-off solenoid control. If the voltage value of the signal output from the sensor 14 during on-off solenoid control is within the range of V15-V22, the range determination processing means determines the neutral range has been selected in on-off solenoid control, and sets the automatic transmission in the neutral range for on-off solenoid control. An overlapping range is set in a border region between the reverse range and the neutral range.

Detail Description Paragraph:
[0071] A voltage value range of V21-V27 is set as the drive range in on-off solenoid control. If the voltage value of the signal output from the sensor 14 during on-off solenoid control is within the voltage value range of V21-V27, the range determination processing means determines that the drive range has been selected during on-off solenoid control, and sets the automatic transmission in the

drive range for on-off solenoid control.

Detail Description Paragraph:
[0074] A voltage value range of V29-V30 is set as indicating the second-speed range in on-off solenoid control. If the voltage value of the signal output from the sensor 14 during on-off solenoid control is within the range of the limits V29-V30, the range determination processing means determines the second-speed range in on-off solenoid control, and sets the automatic transmission in the second-speed range for on-off solenoid control.

Detail Description Paragraph:
[0075] In the range determination apparatus 11 of the first embodiment, start lock control allows the engine to be started only in parking and neutral ranges (non-driving ranges). The ranges for start lock control are set as follows.

Detail Description Paragraph:
[0081] In the range determination apparatus 11 of the first embodiment, the limit V1 for the parking range for start lock control is the same as the limit V1 for the parking range in both linear solenoid control and on-off solenoid control. However, they may be set different from each other.

Detail Description Paragraph:
[0082] In the range determination apparatus 11 of the first embodiment, only the parking range and the neutral range (non-driving ranges) are set for shift lock control, as in the case of start lock control. The voltage values used as limits for determining a range for shift lock control are set equal to the limits V1, V3, V18 and V19 used for determining a range for start lock control, respectively. The aforementioned ranges for shift lock control are set as follows.

Detail Description Paragraph:
[0088] In the range determination apparatus 11 of the first embodiment, key lock is in effect when the vehicle is not in use. Therefore, only the parking range may be set for key lock control. The parking range in key lock control is set as follows.

Detail Description Paragraph:
[0092] In the range determination apparatus 11 of the first embodiment, the parking range, the reverse range, the neutral range, the drive range, the fourth-speed range, the third-speed range, and the second-speed range are also set for failure detection control for detecting a failure in the automatic transmission. The ranges for failure detection control are set as follows.

Detail Description Paragraph:
[0105] The voltage value range of V29-V30 is set as the second-speed range in failure detection control. If the voltage value of the signal output from the sensor 14 during failure detection control is within the range of V29-V30, the range determination processing means 42 determines the second-speed range in failure detection control, sets the automatic transmission in the second-speed range for failure detection control, and the failure detection control processing means 50 sets the automatic transmission in a state of detecting a failure.

Detail Description Paragraph:
[0106] If the voltage value of the signal output from the sensor 14 is not within the range of V29-V30, the range determination processing means 42 does not determine the second-speed range in failure detection control, and the failure detection control processing means 50 sets the automatic transmission in a state of not detecting a failure.

Detail Description Paragraph:
[0107] In the range determination apparatus 11 of the first embodiment, only the reverse range is set for reverse control. The reverse range for reverse control is

set as follows

Detail Description Paragraph:
[0109] If the voltage value of the signal output from the sensor 14 is not within the range of V6-V16 in reverse control, the range determination processing means 42 does not determine that the reverse range has been selected, and the reverse control processing means 51 does not turn on the reverse lamp. In addition, the reverse inhibition control processing means 52 does not perform reverse inhibition at this time.

Detail Description Paragraph:
[0110] In operation of the range determination apparatus 11 of the first embodiment, the parking range, the reverse range, the neutral range, the drive range, the fourth-speed range, the third-speed range, and the second-speed range are also set for indicator control of the automatic transmission. The ranges for indicator control are set as follows.

Detail Description Paragraph:
[0113] The voltage value range of V4-V9 is set as a first intermediate position where no determination of a range is made. The limits V4 and V9 serve to define the first intermediate position in indicator control. An overlapping range is set as a border region between the parking range and the first intermediate position range.

Detail Description Paragraph:
[0115] If the voltage value of the signal output from the sensor 14 is not within the range of V8-V14, the range determination processing means does not determine the reverse range in indicator control. An overlapping range is set for a border region between the first intermediate position and the reverse range.

Detail Description Paragraph:
[0116] A voltage value range of V13-V18 is set as a second intermediate position where no determination of a range is made in indicator control. An overlapping range is set in a border region between the reverse range and the second intermediate position.

Detail Description Paragraph:
[0118] If the voltage value of the signal output from the sensor 14 is not within the range of V17-V20, the range determination processing means 42 does not determine the neutral range in indicator control and an overlapping range is set in a border region between the second intermediate position and the neutral range.

Detail Description Paragraph:
[0122] A voltage value range of V27-V28 is set as the fourth-speed range in indicator control. If the voltage value of the signal out put from the sensor 14 during indicator control is within the range of V27-V28, the range determination processing means 42 determines that the fourth-speed range has been selected in indicator control, sets the automatic transmission in the fourth-speed range for indicator control, and the indicator control processing means 53 executes the indicator control routine.

Detail Description Paragraph:
[0123] A voltage value of V28-V29 is set as the third-speed range in indicator control. If the voltage value of the signal output from the sensor 14 during indicator control is within the range of V28-V29, the range determination processing means 42 determines that the third-speed range has been selected in indicator control, and sets the automatic transmission in the third-speed range for indicator control and the indicator control processing means 53 executes the indicator control routine.

Detail Description Paragraph:

[0124] A voltage value range of V29-V30 is set as the range representing the second-speed range in indicator control. If the voltage value of the signal output from the sensor 14 during indicator control is within the range of V29-V30, the range determination processing means 42 determines the second-speed range in indicator control, and sets the automatic transmission in the second-speed range for indicator control and the indicator control processing means 53 executes the indicator control routine.

Detail Description Paragraph:
[0125] In the range determination apparatus 11 of the first embodiment, the parking range, the reverse range, the neutral range, the drive range, the fourth-speed range, the third-speed range, and the second-speed range are set in engine idling control, as in the aforementioned case of on-off solenoid control. The ranges for engine idling control are set as follows.

Detail Description Paragraph:
[0132] A voltage value range of V29-V30 is set as the second-speed range in engine idling control. If the voltage value of the signal output from the sensor 14 during engine idling control is within the range of V29-V30, the range determination processing means 42 determines the second-speed range has been selected in engine idling control, and sets the automatic transmission in the second-speed range for engine idling control.

Detail Description Paragraph:
[0134] Thus, in the range determination apparatus 11 of the first embodiment, the voltage values determining for the parking range are set arbitrarily and independently for each of the control operations such as linear solenoid control, on-off solenoid control, start lock control, shift lock control, key lock control, failure detection control, indicator control, engine idling control, and the like.

Detail Description Paragraph:
[0139] In the first embodiment, the limits for in each of the aforementioned ranges are set in accordance with a specific purpose.

Detail Description Paragraph:
[0142] As shown in FIG. 4, the range limits for the control operations (below the horizontal line) in the first embodiment are determined on the basis of characteristics inherent to the system as installed in a vehicle, i.e., the ranges for parking lock angle in the parking range, shift lock angle in the parking range, and hydraulic pressure generation angle of the transmission (the ranges above the horizontal line). The terminology "hydraulic pressure generation angle" as used herein has reference to the angular position of the manual shaft 13 which, in turn, governs stroke of the manual valve 33. A parking lock angle is the angle whereas parking gear and a parking pole of the transmission mechanically mesh with each other to lock the wheels, so that the vehicle is prevented from moving. The parking pole is mechanically coupled to and interlocked with the detent 31. The range for shift lock angle utilized in limit determination is that range where the shift lever 21 is mechanically locked. When the shift lever 21 is locked, no range pressure is generated.

Detail Description Paragraph:
[0148] In linear solenoid control, the limits for each of the driving ranges, namely, the reverse range, the drive range, the fourth-speed range, the third-speed range, and the second-speed range are set as ranges whereas hydraulic pressure in the transmission is reliably generated, taking into account the aforementioned variation. Thus, attempted regulation of a pressure by the linear solenoid valve without hydraulic pressure present is prevented. When a shift is made from a non-driving range, such as the parking range or the neutral range, to one of the aforementioned driving ranges, the vehicle can be reliably started in motion without delay. If necessary, the limits for a driving range, such as the drive

range or the reverse range, can also be set within a hydraulic pressure generation range including a range of variation.

Detail Description Paragraph:
[0150] Furthermore, in on-off solenoid control, the limits for each of the driving ranges, namely, the reverse range, the drive range, the fourth-speed range, the third-speed range, and the second-speed range are set as ranges where generation of a hydraulic pressure in the transmission is reliably prevented, with regard for the aforementioned variation. Thus, when a hydraulic pressure is generated, the on-off solenoid is prevented from opening unexpectedly. As a result, no shock is received by the linear solenoid valve, by the hydraulic servos or by the like due to abrupt delivery of the hydraulic pressure to those components.

Detail Description Paragraph:
[0152] Moreover, in failure detection control, the limits for each of the driving ranges, namely, the reverse range, the drive range, the fourth-speed range, the third-speed range, and the second-speed range, are set as ranges where a hydraulic pressure in the transmission is reliably generated regardless of the variation. The limits for a non-driving range, such as the parking range or the neutral range, are set as ranges where generation of a hydraulic pressure in the transmission is reliably prevented allowing for the aforementioned variation Thus, erroneous detection of an error in the automatic transmission (a mechanical error in-the automatic transmission) can be prevented.

Detail Description Paragraph:
[0154] In the first embodiment, the limits for the reverse range during reverse inhibition control are set equal to the limits the reverse range during reverse lamp lighting control. In reverse inhibition control mentioned above, if a signal is in the voltage value range for the reverse range with the vehicle running at a speed equal to or higher than a predetermined speed, the above-mentioned reverse inhibition control is performed to prevent a shift into reverse.

Detail Description Paragraph:
[0155] In addition, the limits for the parking range, the reverse range, the neutral range, the drive range, the fourth-speed range, the third-speed range, and the second-speed range during indicator control are set in consideration of shakiness of the shift lever.21 and the like. In view of such "shakiness", etc., the limits are set so as to be laterally symmetrical with respect to a notch of the detent 31 (which ensures the positioning of the shift lever 21 by the detent 31).

Detail Description Paragraph:
[0157] The limits for a driving range, such as the reverse range, the drive range, the fourth-speed range, the third-speed range, and the second-speed range, during engine idling control are set so as to provide a continuous change from a non-driving range to a driving range and to become wider apart toward the driving range, in consideration of the aforementioned variation. Thus, when a shift from a non-driving range to a driving range is made, the shift to the driving range is noticed at an early stage and the engine speed is raised as soon as possible.

Detail Description Paragraph:
[0158] Next, operation of a limit setting routine executed by a limit setting processing means (not shown) of the automatic transmission control unit 15 will be described. FIG. 5 is a flowchart of the routine for setting limits (thresholds) for each of the ranges in the first embodiment of the present invention, i.e., for setting the range determination patterns shown below the horizontal line in FIG. 4.

Detail Description Paragraph:
[0160] That is, in step S3 limits for linear solenoid control are set, as described above, for each of the parking range, the reverse range, the neutral range, the

drive range, the fourth-speed range, the third-speed range, and the second-speed range are set by the setting processing means and recorded in memory 44 of the automatic transmission control unit 15.

Detail Description Paragraph:
[0161] Next, in step S4 limits for on-off solenoid control are set for each of the parking range, the reverse range, the neutral range, the drive range, the fourth-speed range, the third, speed range, and the second-speed range, and are also recorded in the memory 44 of the automatic transmission control unit 15.

Detail Description Paragraph:
[0165] Next, limits for failure detection control are set in step S8, as described above, for the parking range, the reverse range, the neutral range, the drive range, the fourth-speed range, the third-speed range, and the second-speed range by the limit setting processing means which then records them in the memory 44 of the automatic transmission control unit 15.

Detail Description Paragraph:
[0167] Then, limits for indicator control are set in step S10, as described above, for the parking range, the reverse range, the neutral range, the drive range, the fourth-speed range, the third-speed range, and the second-speed range by the limit setting processing means which then records them in the memory 44 of the automatic transmission control unit 15.

Detail Description Paragraph:
[0168] Next, limits for engine idling control are set in step S11 for the parking range, the reverse range, the neutral range, the drive range, the fourth-speed range, the third-speed range, and the second-speed range by the limit setting processing means and are then recorded in the memory 44 of the automatic transmission control unit 15.

Detail Description Paragraph:
[0169] In addition, limits for range patterns for other control operations (which were omitted from the description of the first embodiment) are set. Thresholds for ranges to be set for those control operations are recorded in the memory 44 of the automatic transmission control unit 15. After the thresholds for the respective control operations have thus been set, the processing is terminated.

Detail Description Paragraph:
[0171] Thus, in the first embodiment, a voltage value of the signal output by the sensor 14 is compared with the range determination pattern arbitrarily set for each of the control operations, and a range is independently determined for each control operation. Therefore, optimal range information can be obtained for each of the control operations and each of the control operations can be appropriately executed.

Detail Description Paragraph:
[0181] As shown in FIG. 7, in the range determination apparatus 11 (FIG. 1) of the third embodiment, the parking range, the reverse range, the neutral range, and the drive range are set as ranges for garage control. Although the fourth-speed range, the third-speed range, and the second-speed range are not described for the third embodiment, they may also be set as described above. The ranges for garage control are set as follows.

Detail Description Paragraph:
[0182] A voltage value range of the limits V31-V32 is set as the parking range in garage control. If a voltage value of the signal output from the sensor 14 during garage control is within the voltage value range of V31-V32, the range determination processing means 42 determines that the parking range has been selected in garage control, and sets the automatic transmission in the parking

range for garage control.

Detail Description Paragraph:
[0186] In the third embodiment, first to third intermediate position ranges, where no determination of range is made, are set between the parking range and the reverse range, between the reverse range and the neutral range, and between the neutral range and the drive range, respectively. The first to third intermediate position ranges are set with voltage value ranges of V32-V33, V34-V35, and V36-V37, respectively.

Detail Description Paragraph:
[0188] The range determination apparatus 11 of the third embodiment, as described above, performs automatic transmission control, engine control, and indicator control by utilizing the first to third intermediate position ranges set as ranges for garage control.

Detail Description Paragraph:
[0191] As described above, the range determination logic is designed to determine a range for each component control operation, for example, automatic transmission control, engine control and the like, namely, to determine a range pattern independently for each of garage control, start lock control, shift lock control, key lock control, failure detection control, reverse inhibition control, and the like. The range displacement determination logic is designed to determine that the range has been changed from one range to a next adjacent range in the first, second, or third intermediate position ranges for garage control. The advance control logic for garage hydraulic pressure control is designed to execute hydraulic pressure control responsive to initiation of movement of the shift lever 21 (FIG. 1) to another (new) range, before the shift-lever 21 reaches the position corresponding to the new range.

Detail Description Paragraph:
[0192] If the automatic transmission control unit 15 determines that a voltage value is in one of the first, second, or third intermediate position ranges, the range displacement (movement) determination processing means (not shown) executes a range displacement determination routine in which it determines, through the range displacement determination logic, from which range to which range the shift lever. 21 is being moved, and generates and outputs a range displacement signal.

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The probable cause is use of unlimited truncation. Revise your search strategy to use limited truncation.

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Search Results - Record(s) 1 through 10 of 12 returned.

☐ 1. Document ID: US 20040249541 A1

L10: Entry 1 of 12 File: PGPB Dec 9, 2004

PGPUB-DOCUMENT-NUMBER: 20040249541
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040249541 A1

TITLE: Shifting system for vehicle

PUBLICATION-DATE: December 9, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Kim, Seung Hoon	Gimpo-city		KR

US-CL-CURRENT: 701/51

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWMC | Draw D

☐ 2. Document ID: US 20040186646 A1

L10: Entry 2 of 12 File: PGPB Sep 23, 2004

PGPUB-DOCUMENT-NUMBER: 20040186646
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040186646 A1

TITLE: Range determination apparatus, range determination method, and program therefor

PUBLICATION-DATE: September 23, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Kuwata, Masayuki	Anjo-shi		JP
Tsugawa, Masayuki	Anjo-shsi		JP
Nakane, Mitsunori	Anjo-shi		JP
Ootsuki, Kaoru	Anjo-shi		JP
Saitou, Masao	Anjo-shi		JP
Suzuki, Kenji	Anjo-shi		JP

US-CL-CURRENT: 701/55; 701/56

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 3. Document ID: US 20040162661 A1

L10: Entry 3 of 12 File: PGPB Aug 19, 2004

PGPUB-DOCUMENT-NUMBER: 20040162661
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040162661 A1

TITLE: Range selection control device of automatic transmission

PUBLICATION-DATE: August 19, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Kikuchi, Masahiko	Kanagawa		JP

US-CL-CURRENT: 701/62; 701/51

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 4. Document ID: US 20020115527 A1

L10: Entry 4 of 12 File: PGPB Aug 22, 2002

PGPUB-DOCUMENT-NUMBER: 20020115527
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020115527 A1

TITLE: Shift controlling method of a transmission

PUBLICATION-DATE: August 22, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Miyata, Hideki	Okazaki-shi		JP
Hojo, Yasuo	Nagoya-shi		JP

Tomomatsu, Hideo Nagoya-shi JP

US-CL-CURRENT: 477/34; 477/97

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 5. Document ID: US 6996465 B2

L10: Entry 5 of 12 File: USPT Feb 7, 2006

US-PAT-NO: 6996465
DOCUMENT-IDENTIFIER: US 6996465 B2

TITLE: Shifting system for vehicle

PRIOR-PUBLICATION:

DOC-ID	DATE
US 20040249541 A1	December 9, 2004

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 6. Document ID: US 6866611 B2

L10: Entry 6 of 12 File: USPT Mar 15, 2005

US-PAT-NO: 6866611
DOCUMENT-IDENTIFIER: US 6866611 B2

TITLE: Vehicle range shift mechanism

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 7. Document ID: US 6835162 B2

L10: Entry 7 of 12 File: USPT Dec 28, 2004

US-PAT-NO: 6835162
DOCUMENT-IDENTIFIER: US 6835162 B2

TITLE: Automatic transmission system for vehicle

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 8. Document ID: US 6589131 B2

L10: Entry 8 of 12 File: USPT Jul 8, 2003

US-PAT-NO: 6589131
DOCUMENT-IDENTIFIER: US 6589131 B2

TITLE: Shift controlling method of a transmission

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWMC | Draw D

☐ 9. Document ID: US 6139468 A

L10: Entry 9 of 12 File: USPT Oct 31, 2000

US-PAT-NO: 6139468
DOCUMENT-IDENTIFIER: US 6139468 A

TITLE: Electronically actuated transmission range control system

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWMC | Draw D

☐ 10. Document ID: US 5505674 A

L10: Entry 10 of 12 File: USPT Apr 9, 1996

US-PAT-NO: 5505674
DOCUMENT-IDENTIFIER: US 5505674 A
**** See image for Certificate of Correction ****

TITLE: Control system with failsafe range passages in a changeover valve for shift-by-wire automatic transmission

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWMC | Draw D

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Terms	Documents
L9 and (operat$ with (freq$ or range or capab$))	12

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Search Results - Record(s) 11 through 12 of 12 returned.

☐ 11. Document ID: US 5409434 A

L10: Entry 11 of 12 File: USPT Apr 25, 1995

US-PAT-NO: 5409434
DOCUMENT-IDENTIFIER: US 5409434 A

TITLE: Control system with failsafe for shift-by-wire automatic transmission

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWMC | Draw D

☐ 12. Document ID: JP 3716837 B2, US 20040162661 A1, EP 1450077 A2, JP 2004251309 A, CN 1530571 A

L10: Entry 12 of 12 File: DWPI Nov 16, 2005

DERWENT-ACC-NO: 2004-634142
DERWENT-WEEK: 200579

TITLE: Range selection control device for use in motor vehicle, has actuator causing transmission to assume operation range and control unit issuing instruction signal by processing range selection command signal obtained from selector

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWMC | Draw D

Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Terms	Documents
L9 and (operat$ with (freq$ or	12

range or capab$))

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Previous Page Next Page Go to Doc#

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L11: Entry 2 of 12 File: PGPB Sep 23, 2004

PGPUB-DOCUMENT-NUMBER: 20040186646
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040186646 A1

TITLE: Range determination apparatus, range determination method, and program therefor

PUBLICATION-DATE: September 23, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Kuwata, Masayuki	Anjo-shi		JP
Tsugawa, Masayuki	Anjo-shsi		JP
Nakane, Mitsunori	Anjo-shi		JP
Ootsuki, Kaoru	Anjo-shi		JP
Saitou, Masao	Anjo-shi		JP
Suzuki, Kenji	Anjo-shi		JP

APPL-NO: 10/739403 [PALM]
DATE FILED: December 19, 2003

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	DOC-ID	APPL-DATE
JP	2003-123899	2003JP-2003-123899	April 28, 2003
JP	2002-381435	2002JP-2002-381435	December 27, 2002

INT-CL-PUBLISHED: [07] G06 F 7/00

US-CL-PUBLISHED: 701/055; 701/056
US-CL-CURRENT: 701/55; 701/56

REPRESENTATIVE-FIGURES: 3

ABSTRACT:

A sensor generates a continuous signal in response to operation of a shift lever, and a range is determined for each of the various control operations by comparing the output value of the signal with a range determination pattern set arbitrarily for each of the control operations. Accordingly, each of the control operations can be performed appropriately by using optimal range information.

Previous Doc Next Doc Go to Doc#

L11: Entry 2 of 12 File: PGPB Sep 23, 2004

DOCUMENT-IDENTIFIER: US 20040186646 A1
TITLE: Range determination apparatus, range determination method, and program therefor

Pre-Grant Publication (PGPub) Document Number:
20040186646

Summary of Invention Paragraph:
[0006] In a conventional vehicle in which a gear ratio is changed by a transmission, for example, an automatic transmission such as a staged automatic transmission, a continuously variable transmission (CVT) or the like, responsive to range selection by operation of a shift lever, an automatic transmission control unit (ECU) switches a solenoid or the like on or off in accordance with a gearshift logic for the selected range and thereby controls gearshift of the transmission. For this purpose, the automatic transmission is provided with a range determination apparatus that receives an output signal from a sensor, determines a range on the basis of the output signal, and determines the selected range.

Summary of Invention Paragraph:
[0007] The sensor mentioned above may be a contact-type sensor having a movable-side terminal and a plurality of fixed-side terminals. The movable-side terminal is attached to a manual shaft that is turned by operation of the shift lever. The fixed-side terminals, with which the movable side terminal is in contact, are attached to a sensor case and provide sliding contact upon turning of the manual shaft. With this contact-type sensor, when the shift lever is operated to select a range, the movable-side terminal is turned via the manual'shaft in accordance with the turning angle of the shift lever, whereby the pattern of contact between the movable-side terminal and the fixed-side terminals is changed. This causes a change in resistance in the electric circuit including the movable-side terminal and the fixed-side terminals. In accordance with this change in the contact pattern, the sensor generates an output signal corresponding to the turning angle of the manual shift, which output signal is either a voltage value or a current value.

Summary of Invention Paragraph:
[0008] Upon receiving the output signal from the contact-type sensor, the range determination apparatus compares the value of that output signal with thresholds as criteria for respective ranges, determines a range, and then determines the selected range. The thresholds (limits) are set in advance as voltage values or current values, depending on the type of the output signal (see U.S. Pat. No. 4,914,594).

Summary of Invention Paragraph:
[0009] However, in the aforementioned contact-type sensor and in the non-contact-type sensor of the related art, when the output value of the sensor is determined, the position of the shift lever is univocally determined, so that the selected range is unequivocally determined. In other words, only a single combination of thresholds for determining a range is set for a given output value of the sensor and a determination of range is made according to a single shift range determination pattern. Therefore, even if different control operations are

performed in an automatic transmission control unit, only one item of range information can be obtained. In other words, optimal range information cannot be obtained for each of the various control operations.

Summary of Invention Paragraph:
[0011] According to one aspect of the present invention, a range determination apparatus comprises a sensor that generates a continuous output signal in response to operation of a shift operation member for selecting a range in a power train, and range determination processing means that compares the value of the output signal with a range determination pattern arbitrarily set for a control operation and that determines a range for that control operation.

Detail Description Paragraph:
[0041] As the shift lever 21 is selectively moved to one of range positions P, R, N, D, 4, 3 and 2 indicated on the guide 22 and representing the respective ranges, the valve spool 33 moves to a valve position preset in association with said one of the range positions to set the manual valve 32 at a corresponding hydraulic pressure generation position and the automatic transmission is shifted to a range corresponding to the hydraulic pressure generation position. With the automatic transmission set to a range, the detent 31 prevents the manual shaft 13 from turning, and the shift lever 21 is held at the selected range.

Detail Description Paragraph:
[0070] A voltage value range of V15-V22 is set as the neutral range in on-off solenoid control. If the voltage value of the signal output from the sensor 14 during on-off solenoid control is within the range of V15-V22, the range determination processing means determines the neutral range has been selected in on-off solenoid control, and sets the automatic transmission in the neutral range for on-off solenoid control. An overlapping range is set in a border region between the reverse range and the neutral range.

Detail Description Paragraph:
[0071] A voltage value range of V21-V27 is set as the drive range in on-off solenoid control. If the voltage value of the signal output from the sensor 14 during on-off solenoid control is within the voltage value range of V21-V27, the range determination processing means determines that the drive range has been selected during on-off solenoid control, and sets the automatic transmission in the drive range for on-off solenoid control.

Detail Description Paragraph:
[0109] If the voltage value of the signal output from the sensor 14 is not within the range of V6-V16 in reverse control, the range determination processing means 42 does not determine that the reverse range has been selected, and the reverse control processing means 51 does not turn on the reverse lamp. In addition, the reverse inhibition control processing means 52 does not perform reverse inhibition at this time.

Detail Description Paragraph:
[0122] A voltage value range of V27-V28 is set as the fourth-speed range in indicator control. If the voltage value of the signal out put from the sensor 14 during indicator control is within the range of V27-V28, the range determination processing means 42 determines that the fourth-speed range has been selected in indicator control, sets the automatic transmission in the fourth-speed range for indicator control, and the indicator control processing means 53 executes the indicator control routine.

Detail Description Paragraph:
[0123] A voltage value of V28-V29 is set as the third-speed range in indicator control. If the voltage value of the signal output from the sensor 14 during indicator control is within the range of V28-V29, the range determination

processing means 42 determines that the third-speed range has been selected in indicator control, and sets the automatic transmission in the third-speed range for indicator control and the indicator control processing means 53 executes the indicator control routine.

Detail Description Paragraph:
[0132] A voltage value range of V29-V30 is set as the second-speed range in engine idling control. If the voltage value of the signal output from the sensor 14 during engine idling control is within the range of V29-V30, the range determination processing means 42 determines the second-speed range has been selected in engine idling control, and sets the automatic transmission in the second-speed range for engine idling control.

Detail Description Paragraph:
[0182] A voltage value range of the limits V31-V32 is set as the parking range in garage control. If a voltage value of the signal output from the sensor 14 during garage control is within the voltage value range of V31-V32, the range determination processing means 42 determines that the parking range has been selected in garage control, and sets the automatic transmission in the parking range for garage control.

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Search Results - Record(s) 1 through 9 of 9 returned.

☐ 1. Document ID: US 20040249541 A1

L12: Entry 1 of 9 File: PGPB Dec 9, 2004

PGPUB-DOCUMENT-NUMBER: 20040249541
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040249541 A1

TITLE: Shifting system for vehicle

PUBLICATION-DATE: December 9, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Kim, Seung Hoon	Gimpo-city		KR

US-CL-CURRENT: 701/51

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWMC | Draw D

☐ 2. Document ID: US 20040186646 A1

L12: Entry 2 of 9 File: PGPB Sep 23, 2004

PGPUB-DOCUMENT-NUMBER: 20040186646
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040186646 A1

TITLE: Range determination apparatus, range determination method, and program therefor

PUBLICATION-DATE: September 23, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Kuwata, Masayuki	Anjo-shi		JP
Tsugawa, Masayuki	Anjo-shsi		JP
Nakane, Mitsunori	Anjo-shi		JP
Ootsuki, Kaoru	Anjo-shi		JP
Saitou, Masao	Anjo-shi		JP
Suzuki, Kenji	Anjo-shi		JP

US-CL-CURRENT: 701/55; 701/56

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWMC | Draw D

☐ 3. Document ID: US 20040162661 A1

L12: Entry 3 of 9 File: PGPB Aug 19, 2004

PGPUB-DOCUMENT-NUMBER: 20040162661
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040162661 A1

TITLE: Range selection control device of automatic transmission

PUBLICATION-DATE: August 19, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Kikuchi, Masahiko	Kanagawa		JP

US-CL-CURRENT: 701/62; 701/51

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWMC | Draw D

☐ 4. Document ID: US 6996465 B2

L12: Entry 4 of 9 File: USPT Feb 7, 2006

US-PAT-NO: 6996465
DOCUMENT-IDENTIFIER: US 6996465 B2

TITLE: Shifting system for vehicle

PRIOR-PUBLICATION:

DOC-ID	DATE
US 20040249541 A1	December 9, 2004

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWMC | Draw D

☐ 5. Document ID: US 6866611 B2

L12: Entry 5 of 9 File: USPT Mar 15, 2005

US-PAT-NO: 6866611
DOCUMENT-IDENTIFIER: US 6866611 B2

TITLE: Vehicle range shift mechanism

Full | Title | Citation | Front | Review | Classification | Date | Reference | References | Attachments | Claims | KWMC | Draw D

☐ 6. Document ID: US 6835162 B2

L12: Entry 6 of 9 File: USPT Dec 28, 2004

US-PAT-NO: 6835162
DOCUMENT-IDENTIFIER: US 6835162 B2

TITLE: Automatic transmission system for vehicle

Full | Title | Citation | Front | Review | Classification | Date | Reference | References | Attachments | Claims | KWMC | Draw D

☐ 7. Document ID: US 6139468 A

L12: Entry 7 of 9 File: USPT Oct 31, 2000

US-PAT-NO: 6139468
DOCUMENT-IDENTIFIER: US 6139468 A

TITLE: Electronically actuated transmission range control system

Full | Title | Citation | Front | Review | Classification | Date | Reference | References | Attachments | Claims | KWMC | Draw D

☐ 8. Document ID: US 5505674 A

L12: Entry 8 of 9 File: USPT Apr 9, 1996

US-PAT-NO: 5505674
DOCUMENT-IDENTIFIER: US 5505674 A
**** See image for Certificate of Correction ****

TITLE: Control system with failsafe range passages in a changeover valve for shift-by-wire automatic transmission

Full | Title | Citation | Front | Review | Classification | Date | Reference | References | Attachments | Claims | KWMC | Draw D

☐ 9. Document ID: US 5409434 A

L12: Entry 9 of 9 File: USPT Apr 25, 1995

US-PAT-NO: 5409434
DOCUMENT-IDENTIFIER: US 5409434 A

TITLE: Control system with failsafe for shift-by-wire automatic transmission

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWMC | Draw D

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Terms	Documents
L11 and (first$ with rang$) and (second$ with rang$)	9

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L13: Entry 3 of 6 File: USPT Mar 15, 2005

US-PAT-NO: 6866611
DOCUMENT-IDENTIFIER: US 6866611 B2

TITLE: Vehicle range shift mechanism

DATE-ISSUED: March 15, 2005

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Tsuzuki; Shigeo	Anjo			JP
Maeda; Jiro	Anjo			JP
Ohkoshi; Naoki	Anjo			JP

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Aisin AW Co., Ltd.				JP	03

APPL-NO: 10/606121 [PALM]
DATE FILED: June 26, 2003

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
JP	2002-207527	July 16, 2002

INT-CL-ISSUED: [07] ~~F16 H 59/62~~

US-CL-ISSUED: 477/97; 477/46, 477/159, 477/160, 477/906, 74/335, 74/336R, 74/473.21, 74/473.12, 475/119, 475/127, 475/132, 475/133
US-CL-CURRENT: 477/~~97~~; 475/~~119~~, 475/~~127~~, 475/132, 475/~~133~~, 477/~~159~~, 477/~~160~~, 477/~~46~~, 477/~~906~~, 74/335, 74/336R, 74/~~473.12~~, 74/473.~~21~~

FIELD-OF-CLASSIFICATION-SEARCH: 477/97, 477/906, 477/46, 477/160, 477/159, 74/335, 74/336R, 74/473.21, 74/473.12, 475/119, 475/127, 475/132, 475/133
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL Clear

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	5092198	March 1992	Morishige et al.	477/46

☐	5505674	April 1996	Furukawa et al.	477/130
☐	5601510	February 1997	Sakakiyama et al.	477/96
☐	5901608	May 1999	Takeyama	74/335
☐	6499371	December 2002	Tsuzuki et al.	74/335
☐	6589133	July 2003	Kusafuka et al.	477/97

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	CLASS
07-190180	July 1995	JP	
WO 01/42687	June 2001	WO	

ART-UNIT: 3681

PRIMARY-EXAMINER: Marmor; Charles A.

ASSISTANT-EXAMINER: Le; David D.

ATTY-AGENT-FIRM: Lorusso, Loud & Kelly

ABSTRACT:

A judging section judges whether or not ranges detected, respectively, by a first range detection section consisting of a first detection section and a position detecting sensor, and a second range detection section consisting of a second detection section; a C1 detecting sensor and a B1 detecting sensor are in mutual agreement, and when the detected ranges are not in mutual agreement, a failure judging section judges a failure of the first range detection section.

9 Claims, 10 Drawing figures

Previous Doc Next Doc Go to Doc#

L13: Entry 3 of 6 File: USPT Mar 15, 2005

DOCUMENT-IDENTIFIER: US 6866611 B2
TITLE: Vehicle range shift mechanism

Brief Summary Text (6):
The present invention relates to a range shift mechanism mounted in a vehicle or the like, and in particular, to a range shift mechanism (so-called shift-by-wire) interlocked with the operation of a range selecting mechanism, such as a shift lever, and controls, for example, a hydraulic control unit, to change over a shift range.

Brief Summary Text (10):
A range shift mechanism in answer to the aforementioned demands is proposed, for example, in Japanese Patent Laid-Open Publication ("Kokai") No. 7-190180. The range shift mechanism disclosed in the Kokai 7-190190 includes an electric motor which transmits torque to a manual valve to operate the manual valve and thereby change the shift range. However, such a range shift mechanism may have difficulty in changing to a desired shift range due to, for example, failure of a position detecting sensor (position sensor) for detecting the target shift range, or difficulty in recognizing position with the sensor due to, for example, influences of noise or temperature.

Brief Summary Text (15):
Accordingly, the present invention provides a vehicle range shift mechanism including a range selecting device for selecting a shift range (for example, P, R, N, D, or Ds range), a drive mechanism that is interlocked with and drives the range selecting device, a range shift controller that operates a changeover valve with the driving force of the drive mechanism to change the shift range (for example, P, R, N, D, and Ds range) of an automatic transmission, and a transmitting mechanism that transmits the driving force of the drive mechanism to the range shift controller.

Brief Summary Text (18):
The vehicle range shift mechanism according to the present invention may be applied to an automatic transmission provided with first and second friction engaging elements that respectively correspond to a forward range (for example, D or Ds range) and a reverse range (R range), and first and second hydraulic servos that respectively operate the first and second friction engaging elements. In this case the second range detection section is provided with first and second hydraulic pressure detecting sensors that respectively detect the presence of hydraulic pressure supplied to the first and second hydraulic servos, and a range judging section that judges the shift range (for example, P, R, N, D, and Ds range) of the automatic transmission based upon signals received from these hydraulic pressure detecting sensors. The range judging section judges that the shift range is a forward range (for example, D or Ds range) when the first hydraulic pressure detecting sensor detects hydraulic pressure supplied to the first hydraulic servo and the second hydraulic pressure detecting sensor detects supply of hydraulic pressure to the second hydraulic servo, judges that the shift range is a reverse range (for example, R range) when the first hydraulic pressure detecting sensor does not detect supply of hydraulic pressure to the first hydraulic servo and the

second hydraulic pressure detecting sensor detects the supply of hydraulic pressure to the second hydraulic servo, and judges that the shift range is a non-traveling range (for example, P or N range) when neither of hydraulic pressure detecting sensors detects supply of hydraulic pressure.

Brief Summary Text (24):
With the vehicle range shift mechanism of the present invention where the detection result from the first range detection section, in which the shift range corresponding to the operating position of the transmitting mechanism is detected, and the detection result from the second range detection section, in which the actual changed over shift range is detected, are not in mutual agreement and the failure judging mechanism judges a failure of the first range detection section, that is, where a shift range different from the desired range was actually established, the transmission may be shifted to a safer state by the controller executing the preset fail-safe procedure. For example, if an alarm is generated as a sound or a light as a fail-safe procedure, when the desired shift range selected by the driver is not the same as the actual, newly established shift range, despite proper operation of the range selecting mechanism while traveling, the driver immediately recognizes that situation and can take appropriate action.

Brief Summary Text (27):
When the results of detection of the first and second range detection sections are not in mutual agreement and a failure of the first range detection section is judged, if a vehicle traveling speed equal to or greater than the predetermined value is detected, an alarm is generated in the form of the sounding of a buzzer or the lighting of a lamp while stopping the drive of the drive mechanism as a fail-safe procedure. Thus, even when changing to a desired shift range encounters difficulty during travel, the driver is immediately notified of the situation. Consequently, the driver can bring the vehicle to a stop on the side of the road by braking or take other appropriate action. In this case, the alarm from the buzzer and the lamp may be cancelled when, for example, the range selecting mechanism is returned to a neutral position.

Brief Summary Text (31):
In another embodiment when the outputs of the first and second range detection sections are not in agreement and a failure of the first range detection section is judged, if the detected vehicle traveling speed is less than the predetermined value, an alarm is generated by the sounding of a buzzer or the lighting of a lamp while stopping the drive mechanism. Thus, even when a change to a desired shift range encounters difficulty during stopping or the like, the driver can be immediately notified of that situation. In this case, the alarm can be cancelled when, for example, the range selecting mechanism is returned to the neutral position.

Detailed Description Text (15):
The shift lever position detector 23 detects the position (shift position) of a shift lever 25 (or shift switch, etc.), which is a range selecting mechanism for selecting a shift range (P, R, N, D, or Ds range), and outputs a range selection signal to the shift operation controller 20. In addition the speed detection section 27 detects the rotation of a secondary shaft. 127 (see FIG. 4), which is a rotational element on the output side of the automatic transmission 101, based upon a rotation detecting signal from an electromagnetic pick-up 163 (see FIG. 4) to be described later.

Detailed Description Text (17):
The automatic transmission 101 has a direct clutch (a first friction engaging element) C1 and a reverse brake (a second friction engaging element) B1 corresponding to a forward range, such as D and Ds range, and R range (reverse range), respectively, and a hydraulic servo (a first hydraulic servo) C1 and a hydraulic servo (a second hydraulic servo) B1' which respectively operate the

direct clutch C1 and the reverse brake B1. The direct clutch C1 is a forward range element that is always engaged in the D and Ds ranges, and the reverse brake B1 is a reverse range element that becomes engaged upon shifting to the R range. Neither the direct clutch C1 nor the reverse brake B1 are engaged in a non-traveling range, i.e., P (parking), or N (neutral).

Detailed Description Text (44):
The range shift mechanism 1 operates as follows. Namely, while the vehicle is traveling or stopped, a shift signal S1 corresponding to the shift lever position (shift position) selected by manual operation of the driver is output as an electric signal from the shift lever 25 to the shift lever position detector 23. The shift lever position detector 23 calculates the shift position currently selected by the shift lever 25 in accordance with the shift signal S1, and outputs as a shift position signal S2 to the shift operation controller 20. The shift operation controller 20 judges a change in shift position by monitoring the shift position signal S2.

Detailed Description Text (57):
When the shift lever 25 is operated, the new position of the shift lever 25 is detected by the shift lever position detector 23, and commands from the shift operation controller 20 are output to the motor drive controller 19 and the clutch driver controller 22. Thus, the deceleration gear mechanism 46 including the output gear 17, the range control shaft 7, and the like, is operated at the appropriate time by the motor drive controller 19 driving and controlling the electric motor 12, and the clutch drive controller 22 controlling the connecting and disconnecting operation of the electromagnetic clutch 30. At this time, the position detecting sensor 21 detects the operating position of the transmitting mechanism composed of the deceleration gear mechanism 46 and the like, and the first detection section 18 detects a shift range Sr corresponding to the detected operating position (step S1).

Detailed Description Text (66):
As described above, with the range shift mechanism 1 of this first embodiment, the fail-safe procedure is executed when the shift range intentionally selected by the driver with operation of the shift lever 25, in other words, the detected result of the shift range Sr corresponding to the operating position of the output gear 17 of the deceleration gear mechanism 46 and the like, is not in agreement with the shift range Cr to which the automatic transmission 101 is actually shifted. Therefore, even if the shift range of the automatic transmission 101 does not change to the desired range, the problem can be resolved by shifting to a safer state.

Detailed Description Text (72):
The manual valve 2 is operated by the rotation of the detent lever 5, and the hydraulic control unit 3 changes the shift range in a manner corresponding to the repositioning of the shift lever 25. At this time, the input side rotation detecting sensor 53 detects the rotation of the input shaft 112, the output side rotation detecting sensor 54 detects the rotation of the right and left axles 160 and 161, and based upon the detected values for rotation, the third detection section 33 determines if the shift range Cr newly established by the shift operation corresponds to the operation of the shift lever 25 (step S22).

Detailed Description Text (76):
As described above, according to the first and second embodiments of the present invention, when the range detected by the first detection section, i.e., the shift range corresponding to the position of the deceleration gear mechanism 46, and the range detected by the second range detection section, i.e., the actual newly established shift range, are not in mutual agreement, the judging sections 29 and 34 operate as a failure judging section to judge a failure of the first range detection section. Therefore, it is possible to rapidly and appropriately execute countermeasures when a failure occurs by reliably detecting a failure of the

position detecting sensor 21.

Detailed Description Text (78):
In addition, when the shift range detected by the first range detection section, corresponding to the operating position of the transmitting mechanism such as the range control shaft 7, the electromagnetic clutch 30, and the deceleration gear mechanism 46, and the actual shift range detected by the second range detection section are not in agreement, that is, when the shift range could not be changed over to the shift range selected by the driver, a shift to a safer state is executed by the motor drive controller 19, the shift operation controller 20, the clutch driver controller 22, and the alarm device 26, executing the preset fail-safe procedure.

Detailed Description Text (79):
When the ranges detected by the first and second range detection sections are not in mutual agreement and a failure of the first range detection section is judged, if the vehicle traveling speed is equal to or greater than the predetermined value, an alarm is generated by the sounding of the buzzer 15 or the lighting of the lamp 16 while stopping the drive of the drive mechanism, such as the electric motor 12, as a fail-safe procedure. Therefore, even when changing to the selected shift range encounters difficulty during travel, the driver can be immediately notified of that situation. Thus, the driver immediately recognizes the situation and can take appropriate action.

Detailed Description Text (81):
Furthermore, in the case where the ranges detected by the first and second range detection sections are not in mutual agreement and a failure of the first range detection section is judged, if the vehicle traveling speed is less than the predetermined value, an alarm is generated by the sounding of the buzzer 15 and/or the lighting of the lamp 16 while stopping the drive of a drive mechanism such as the electric motor 12. Therefore, in this manner also, when changing to a selected shift range encounters difficulty during stopping, the driver can immediately recognize that situation.

CLAIMS:

1. A vehicle range shift mechanism comprising: a range selecting mechanism for selecting a shift range; a drive mechanism that is interlocked with and drives the range selecting mechanism; a range operating mechanism for operating a changeover valve with the driving force of the drive mechanism to change the shift range of an automatic transmission; a transmitting mechanism for transmitting driving force of the drive mechanism to the range operating mechanism; a first range detection section that detects a shift range corresponding to an operating position of the transmitting mechanism; a second range detection section that detects an actual shift range as changed by the range operating mechanism; a judging section that judges whether or not the shift ranges detected by the first and second range detection sections are in mutual agreement; a failure judging section that judges a failure of the first range detection section when the detected ranges are judged by the judging section as not in mutual agreement; a controller that executes a preset fail-safe procedure when the failure judging section judges a failure; and a speed detecting sensor that detects a vehicle traveling speed, and wherein the controller generates an alarm and stops the drive mechanism as a fail-safe procedure, responsive to judgement of failure by the failure judging section, detection of a traveling range by the second range detection section, and detection of a traveling speed equal to or greater than a predetermined value by the speed detecting sensor.

4. The vehicle range shift mechanism according to claim 1, wherein the automatic transmission is provided with first and second friction engaging elements that respectively correspond to a forward range and a reverse range, and first and

second hydraulic servos that respectively operate the first and second friction engaging elements; wherein the second range detection section is provided with first and second hydraulic pressure detecting sensors that respectively detect the presence of hydraulic pressure supplied to the first and second hydraulic servos, and a range judging section that judges the shift range of the automatic transmission based upon input from both hydraulic pressure detecting sensors, and wherein the range judging section judges the shift range as a forward range when the first hydraulic pressure detecting sensor detects hydraulic pressure supplied to the first hydraulic servo and the second hydraulic pressure detecting sensor detects hydraulic pressure supplied to the second hydraulic servo, judges the shift range as a reverse range when the first hydraulic pressure detecting sensor does not detect the supply of hydraulic pressure to the first hydraulic servo and the second hydraulic pressure detecting sensor detects the supply of hydraulic pressure to the second hydraulic servo, and judges the shift range as a non-traveling range when neither of the hydraulic pressure detecting sensors detects a supply of hydraulic pressure.

Previous Doc Next Doc Go to Doc#

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See application file for complete search history.

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Search Selected Search ALL Clear

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ABSTRACT:

An automatic transmission system for a vehicle includes a shift-by-wire system which converts a selected command operation range of a range selector into an electric signal and which changes an actual operation range of an automatic transmission into the selected command operation range by driving an actuator according to the electric signal. A lock mechanism restricts the operation of the range selector when the shift-by-wire system is electrically turned off regardless of the present operation range of the range selector.

8 Claims, 14 Drawing figures

Previous Doc Next Doc Go to Doc#

L13: Entry 4 of 6 File: USPT Dec 28, 2004

DOCUMENT-IDENTIFIER: US 6835162 B2
TITLE: Automatic transmission system for vehicle

Abstract Text (1):
An automatic transmission system for a vehicle includes a shift-by-wire system which converts a selected command operation range of a range selector into an electric signal and which changes an actual operation range of an automatic transmission into the selected command operation range by driving an actuator according to the electric signal. A lock mechanism restricts the operation of the range selector when the shift-by-wire system is electrically turned off regardless of the present operation range of the range selector.

Brief Summary Text (3):
A shift lever of an automatic transmission system for a vehicle is provided with a shift lock mechanism for preventing a displacement of shift lever until an ignition switch is again turned on when parking range (P range position) is selected by a driver through the shift lever under a condition that the ignition switch is turned off.

Brief Summary Text (4):
Japanese Patent Provisional Publication No. (Heisei) 5-322031 discloses a shift-by-wire type automatic transmission system wherein an operation of a shift lever is converted into an electric signal. A manual valve and a parking mechanism of an automatic transmission are controlled by an electrically operated actuator according to the electric signal to change of an operation range of an automatic transmission.

Brief Summary Text (7):
It is therefore an object of the present invention to prove a shift-by-wire type automatic transmission system which preferably controls the operation of a range selector such as a shift lever so as to prevent a discord between an operation range selected by the range selector and an actual operation range selected in an automatic transmission.

Brief Summary Text (8):
An aspect of the present invention resides in an automatic transmission system which is for a vehicle and comprises an automatic transmission, a range selector, a shift-by-wire system and a lock mechanism. The automatic transmission selectively takes a plurality of operation ranges. The range selector is operated by a driver of the vehicle to select one of command operation ranges. The shift-by-wire system converts the selected command operation range into an electric signal and changes an actual operation range of the automatic transmission into the selected command operation range by driving an actuator according to the electric signal. The lock mechanism restricts the operation of the range selector when the shift-by-wire mechanism is electrically turned off.

Brief Summary Text (9):
Another aspect of the present invention resides in a method of controlling an automatic transmission system for a vehicle, the automatic transmission comprising

an automatic transmission which selectively takes a plurality of operation ranges, a range selector which is operated by a driver of the vehicle to select one of command operation ranges and a shift-by-wire system which converts the selected command operation range into an electric signal and changes an actual operation range of the automatic transmission into the selected command operation range by driving an actuator according to the electric signal, the method comprising restricting the operation of the range selector when the shift-by-wire mechanism is electrically turned off.

Drawing Description Text (3):
FIG. 2 is a schematic view showing a range selecting mechanism in an automatic transmission employed in the automatic transmission system.

Drawing Description Text (5):
FIG. 4 is a side view showing a range selecting device in the automatic transmission system of FIG. 1.

Drawing Description Text (6):
FIG. 5 is a plan view showing a shift lock mechanism of the range selecting device.

Drawing Description Text (11):
FIG. 10 is a side view showing a shift lock canceling mechanism of the range selecting device.

Drawing Description Text (13):
FIG. 12 is a side view showing a range selecting device employed in a second embodiment according to the present invention.

Detailed Description Text (3):
As shown in FIG. 1, the automatic transmission system comprises a control unit 1, a range selecting device 2 and an automatic transmission 3 which are electronically connected with each other through signal circuits to exchange information in the form of electric signals through signal circuits. Further, control unit 1, range selecting device 2 and automatic transmission 3 receive electric power of battery 5 through electric power circuits. Particularly, in reply to the turning-on of an ignition switch 7 (ING ON), a battery 5 supplies electric power to a main power supply circuit (IGN power supply circuit) 6 through an ignition relay (IGN relay) 8. Control unit 1 and a shift actuator 4 of a shift-by-wire system for automatic transmission 3 receive electric power from IGN power supply circuit 6. That is, the automatic control transmission system employs a shift-by-wire shifting system.

Detailed Description Text (4):
Range selecting device 2 comprises a shift button set 30 acting as an operating section, a shift switch 12, a shift lock actuator 14 and a shift lock canceling switch 16. The operating section may be a shift lever manipulated by a driver. Shift switch 12 detects a range position selected by the driver through shift button set 30. Shift lock actuator 14 controls a shift lock mechanism 13 which prevents a change of the selected operation range during the turn-off state of ignition switch 7 (IGN OFF state). Shift lock canceling switch 16 is interlocked with a shift lock canceling mechanism 15. Shift lock actuator 14 always receives electric power from battery 5 since shift lock actuator 14 is directly connected to battery 5 and is not affected by the turning on and off of ignition switch 7.

Detailed Description Text (6):
Control unit 1 comprises a shift control section 17, a fail determining section 18 and a shift lock control section 20. Shift control section 17 outputs an operation signal for a motor 23 to an amplifier 22 of shift actuator 4 in automatic transmission 3 on the basis of a state of shift switch 12 and a signal of inhibitor switch 21 which is indicative of an actual range position of automatic transmission

3. The operation of shift control section 17 is terminated when ignition switch 7 is turned off (IGN OFF). That is, the shift actuator 4 of automatic transmission 3 and control unit 1 constitute the shift-by-wire system (mechanism) so that the shift-by-wire system converts the command operation range selected in range selecting device 2 into an electric signal and changes an actual operation range of the automatic transmission 3 into the selected command operation range by driving shift actuator 4 according to the electric signal.

Detailed Description Text (10):
As shown in FIG. 2, a mechanical construction of a range selecting mechanism in automatic transmission 3 employs motor 23 and a wire cable (or rod) 27 through which the range selecting operation by motor 23 is inputted into automatic transmission 3. The range selecting operation of the range selecting mechanism of automatic transmission 3 is achieved by the operations of a manual valve and a parking mechanism of automatic transmission 3 in response to the signal from control unit 1.

Detailed Description Text (13):
FIGS. 4 to 6 show range selecting device 2, shift lock mechanism 13 and shift lock canceling mechanism 15.

Detailed Description Text (14):
Shift button set 30 is of a button type and acts as a manual operation section of range selecting device 2. Shift button set 30 comprises shift buttons 30a, 30b, 30c, 30d, 30e and 30f corresponding to selectable ranges such as P (parking) range, R (reverse) range, N (neutral) range, D (drive) range, 2 range and 1 range, respectively. By pressing a desired one of shift buttons 30a to 30f, shift switch 12 corresponding to the pressed button is turned on so as to select a desired (command) operation range.

Detailed Description Text (21):
With this arrangement of the automatic transmission system according to the first embodiment of the present invention, when ignition switch 7 is put in IGN OFF state (IGN OFF), shift lock control section 20 operates the shift lock mechanism so that shift buttons 30a to 30f are put in the shift lock condition. Therefore, when IGN OFF, that is, when the power supply of shift actuator 4 of the shift-by-wire mechanism is turned off, even if the shift position is set at a position except for P range, the displacement of shift buttons 30a to 30f is restricted. This arrangement solves a problem that when shift actuator 4 cannot be driven, the range selected by shift buttons 30a to 30f becomes different from the range of automatic transmission 3.

Detailed Description Text (22):
Further, when the automatic transmission system is put in a fail state, shift lock control section 20 operates shift lock mechanism 13 so that shift buttons 30a to 30f are put in the shift lock condition, and fail determining section 18 shuts off the power supply to shift actuator 4. Therefore, during the fail state, this arrangement according to the present invention prevents the automatic transmission system from incorrectly performing, and solves a problem that the range selected through shift buttons 30 to 30f becomes different from the range of automatic transmission 3.

Detailed Description Text (24):
Therefore, even if shift buttons 30a to 30f are controlled after the cancellation of the shift lock, the range selected by shift buttons 30a to 30f corresponds with the range of automatic transmission 3 by the above-discussed displacement restricting (preventing) setting. That is, the above-discussed arrangement according to the present invention prevents the discord between the range selected by shift buttons 30a to 30f and the range of automatic transmission 3.

Detailed Description Text (26):
Referring to FIGS. 12 to 14, there is shown a second embodiment of the automatic transmission system according to the present invention. The automatic transmission of the second embodiment employs a lever-type operating section of range selecting device 2 and a shift-by-wire shifting system.

Detailed Description Text (27):
As shown in FIG. 12, a lever 50 of range selecting device 2 is movable on positions corresponding to P range, R range, N range, D range, 2 range and 1 range which are aligned in the fore-and-aft direction. A shift switch 51 for detecting the position of lever 50 is provided on the base portion of lever 50.

Detailed Description Text (31):
Although a shift lock canceling mechanism is not shown in FIGS. 13 and 14, a mechanism similar to shift lock cancel mechanism 15 shown in FIG. 10 may be installed in the system. The other construction of the second embodiment is basically the same as that of the first embodiment shown in FIGS. 1 and 2. Accordingly, as is similar to the button type operating section of range selecting device 2 of the first embodiment, the automatic transmission system of the second embodiment prevents the discord between the selected range selected by range selecting device 2 and the actual range in automatic transmission 3.

Detailed Description Text (32):
Each of shift lock mechanisms 13 and 52 may be arranged so as to restrict the displacement of control section (shift button set 30 and lever 50) of range selecting device 2 at least from the parking range.

CLAIMS:

1. An automatic transmission system for a vehicle, comprising: an automatic transmission selectively taking a plurality of operation ranges; a range selector operated by a driver of the vehicle to select one of command operation ranges; a shift-by-wire system converting a selected command operation range into an electric signal and changing an actual operation range of the automatic transmission into the selected command operation range by driving an actuator according to the electric signal; a lock mechanism restricting an operation of the range selector when the shift-by-wire system is electrically turned off ; and a lock canceling mechanism which is operable for canceling the restricting operation of the lock mechanism, the shift-by-wire system being electrically turned on in response to the canceling operation of the lock canceling mechanism.

5. An automatic transmission system for a vehicle, comprising: an automatic transmission selectively taking a plurality of operation ranges; a range selector selecting one of command operation ranges in response to a driver's command; a lock actuator locking the range selector in response to a command lock signal; a lock canceling mechanism canceling a restricting operation of the lock actuator according to a manual operation of a driver of the vehicle; a shift actuator changing an actual operation range of the automatic transmission in response to a control signal; a lock canceling switch electrically turning on the shift actuator when the lock canceling mechanism executes an canceling operation of the restricting operation; and a control unit outputting the control signal to the shift actuator according to the selected command operation range of the range selector; wherein the lock actuator locks the range selector when the shift actuator is electrically turned off.

7. A method of controlling an automatic transmission system for a vehicle, the automatic transmission comprising an automatic transmission which selectively takes a plurality of operation ranges, a range selector which is operated by a driver of the vehicle to select one of command operation ranges and a shift-by-wire system which converts the selected command operation range into an electric signal and

changes an actual operation range of the automatic transmission into the selected command operation range by driving an actuator according to the electric signal, the method comprising: restricting the operation of the range selector when the shift-by-wire mechanism is electrically turned off ; and electrically turning on the shift-by-wire system in response to a canceling operation of a lock canceling mechanism which is operable for canceling the restricting operation of the lock mechanism.

8. An automatic transmission system for a vehicle, comprising: transmission means for selectively taking a plurality of operation ranges; selector means, operated by a driver of the vehicle, for selecting one of command operation ranges according to a driver's command; shift-by-wire means for converting a selected command operation range into an electric signal and for changing an actual operation range of the transmission means into the selected command operation range according to the electric signal; lock means for restricting the operation of the selector means when the shift-by-wire means is electrically turned off ; and a lock canceling mechanism which is operable for canceling the restricting operation of the lock mechanism, the shift-by-wire system being electrically turned on in response to the canceling operation of the lock canceling mechanism.

Previous Doc Next Doc Go to Doc#